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PARTICIPATION IN THE CORN PROGRAM: THE FARM OWNER/OPERATOR DECISION

by

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Socioeconomic characteristics, profitability considerations, and opinion regarding agriculture programs are analyzed relative to the decisions of Ohio farm operators to (1) establish a corn acreage base on owned land and (2) set corn acres aside in 1991. Probabilities of establishing a base acreage and setting land aside increase as corn acres, specialization in crops, and debt-asset ratio increase. These findings suggest that farms with these characteristics will be most affected by downsizing the corn program. Operators who establish a base acreage are associated with lower expected yield and higher chemical expenses, suggesting participants may be less economically efficient than nonparticipants.

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U.S. farm income support programs rely on voluntary participation by farm operators to attain their objectives. Therefore, knowledge of the characteristics of farm operations which participate in these programs is instrumental to the design, operation, and evaluation of the programs. At present the farm policy debate is focused on reducing and/or eliminating farm income support programs in order to reduce federal expenditures. An understanding of which farm operations participate in farm programs is important in evaluating who will be most effected by downsizing these programs.

Previous studies of the socioeconomic characteristics of farm operations which participate in farm price and income support programs include Vermeer; Slaughter; Bonnen; Lin, Johnson, and Calvin; Townsend and Martin; Johnson and Short; Nelson; Reinsel and Banker; Reinsel; and Goodwin and Featherstone. Only Slaughter; Townsend and Martin; and Goodwin and Featherstone employ econometric analysis; the others use descriptive statistics. As a group, these studies find that participation is associated with larger farm size, higher variable cost of production, and specialization in crop production. The evidence for other socioeconomic characteristics is mixed.

Another group of studies find that the profitability of participating in farm programs significantly affects the decision to participate, and therefore, acreage planted by farm operators. Recent examples of these studies include Menzie and Van

Meir; Burt and Worthington; McIntosh and Shideed; Subotnik; and Chembezi and Womack.

A third group of studies find that the opinion of farm operators concerning the appropriate direction for farm programs (i.e., free market vs. current programs vs. mandatory controls, etc.) varies with the characteristics of the farm and farm operators. This finding suggests that operator opinion regarding farm programs may significantly affect the decision to participate. Recent examples of these studies include Lasley, Geller and Hoiberg; Edelman and Lasley; Orazem, Otto, and Edelman; and Barkley and Flinchbaugh.

This study combines socioeconomic characteristics, profitability considerations, and opinions regarding farm programs into an econometric analysis of the decisions of Ohio farm operators (1) to establish a corn acreage base and (2) to set corn acres aside in 1991. Including all three types of variables should reduce misspecification problems which can result from not including relevant variables in an analysis. In addition, previous studies do not distinguished between the two decisions. Evaluating the decisions separately allows differential impacts, if any, to be ascertained.

The U.S. corn program is described in the next section. Empirical models for the base acreage and land set aside decisions are developed. Results from the two logit analyses are then presented. Based on the results, conclusions and implications are drawn.

THE U.S. CORN PROGRAM

As with all crops which receive a federal income deficiency payment, the decision to participate in the U.S. corn program is a two step process. First, the farm operator and/or land owner must decide whether to establish an acreage base with the Agricultural Stabilization and Conservation Service (ASCS). Second, in order to establish eligibility for deficiency payments and nonrecourse loans in a given crop year, a proportion of the acreage base may have to be set aside (i.e., not planted).

ASCS acreage base for corn equals the average number of acres planted and considered planted[1] to corn for harvest during each of the five crop years preceding the current crop year (U.S. House of Representatives, Title V, Sec. 503 (b) (1)). In 1992, 89,105 entities in Ohio had an ASCS corn acreage base (USDA, June 1993, p. 7).

Set-aside or idled acres are "withdrawn from production and must be maintained in a soil conserving use to reduce erosion and weed infestations" (USDA, May 1990). Percent of the corn acreage base which must be set aside varies from crop year to crop year, with the primary determinant being the relationship between supply and demand.

Beginning with the 1991 crop, a proportion of the corn acreage base is designated as flexible (i.e., flex) acres. Flex acres can be planted to program crops, as well as any other crop except fruits and vegetables. Crops grown on flex acres are eligible for nonrecourse loans (if available) but can not receive deficiency payments

(USDA, June 1991, p. 35). Mandatory flex acres total 15 percent of the corn base. Another 10 percent of the base can be designated as optional flex acres (USDA, 1/91, p. 1).

Besides establishing an ASCS corn acreage base, a farm operator also must establish a corn yield with ASCS. This yield, referred to as the payment yield, is calculated by averaging the program yields established for the 1981 through 1985 crop years after eliminating the highest and lowest program yields (U.S. House of Representatives, Title V, Sec. 505 (c)). Program yield equals a farm's proven yield for the five previous crop years after eliminating the highest and lowest yields based on grain slips, measured bins and certified or determined acres. If proven yields are not available, a farm's program yield is the average program yield for similar farms in the area as judged by the county ASCS committee (USDA, 1986, p. 2).

Empirical Models

While the decision to establish a corn acreage base with ASCS and the decision to set land aside are different, they are interrelated. One common factor is the profitability of setting land aside. An acreage base is more likely to be established if setting land aside is profitable. Other common factors are the characteristics of the operator and business.

The empirical models developed below apply only to land which a farm operator owns. This restriction is imposed because the owner and operator are the

same on owned land. On rented land, farming decisions may be jointly made by the operator and a different owner. Thus, the decision to establish an ASCS corn acreage base and to set land aside can be more complex on rented land.

Profitability of Setting Land Aside

The profitability of setting land aside involves comparing the net returns from not setting land aside with the net returns from setting land aside. If land is not set aside, gross return and production cost are:

$$(1)\quad GRNSA = P \bullet YNSA \bullet LNSA$$

$$(2)\quad VCNSA = LNSA \bullet VCPANSA$$

where: GRNSA = Expected Gross Return if Land is Not Set Aside
VCNSA = Expected Variable Production Cost if Land is Not Set Aside
P = Expected Price per Bushel at Harvest
YNSA = Expected Yield per Acre if Land is Not Set Aside
LNSA = Expected Harvested Corn Acres if Land is Not Set Aside
VCPANSA = Expected Variable Production Cost per Acre if Land is Not Set Aside

In contrast, if land is set aside gross return and production cost equal:

$$(3)\quad GRSA = MAX(P, LR) \bullet YSA \bullet ASCSB \bullet [1 - \delta] + MAX[0, TP - MAX(LR, DPP)] \bullet [1 - (\delta + \Phi)] \bullet ASCSB \bullet PY$$

$$(4)\quad VCSA = (1 - \delta) \bullet ASCSB \bullet VCPASA + \delta \bullet ASCSB \bullet MCPA$$

where: GRSA = Expected Gross Return if Land is Set Aside
VCSA = Expected Variable Production Costs if Land is Set Aside
LR = Nonrecourse Loan Rate
YSA = Expected Yield if Land is Set Aside
ASCSB = ASCS Corn Base Acres
δ = Percent of Land Set-Aside

TP = Target Price
DPP = Expected Deficiency Payment Price[2]
Φ = Percent of Land in Flex Acres
PY = Corn Program Payment Yield
VCPASA = Expected Variable Production Cost per Acre if Land is Set Aside
MCPA = Expected Cost per Acre of Maintaining Set-Aside Land in a State Consistent with Farm Program Regulations

Some of the variables are expectations because the decision to set land aside is made before the crop is planted. Fixed costs of production are not considered because they are incurred whether or not the farm operator sets land aside.

To simplify equation 3, it is assumed that a farm operator who sets land aside plants mandatory flex acres to corn and does not participate in the optional flex acre program. To simplify the comparison between setting land aside and not setting land aside, it is also assumed that (1) a farm operator who does not set land aside will plant acres of corn equal to the number of corn base acres (i.e., LNSA = ASCSB), (2) per acre expected variable cost of production is the same whether or not land is set aside (i.e., VCPANSA = VCPASA = VCPA), (3) per acre yield is the same whether or not land is set aside (i.e, YNSA = YSA = Y) and (4) expected deficiency payment price equals the expected harvest price (i.e., DPP = P). These assumptions do not hold in all situations, but they simplify the comparison without significantly altering its conclusions.

Invoking the simplifying assumptions, combining equations 1 through 4, and rearranging terms generates the following equation:

$$(5) \quad K = MAX(P, LR) \bullet Y \bullet ASCSB \bullet (1 - \delta) + MAX[0, TP - MAX(LR,P)] \bullet (1 - \delta - \Phi) \bullet ASCSB \bullet PY + \delta \bullet ASCSB \bullet VCPA - \delta \bullet ASCSB \bullet MCPA - (P \bullet Y \bullet ASCSB)$$

where: K = Net Return to Setting Land Aside Relative to Not Setting Land Aside

If $K > 0$, an economically rational farm operator sets land aside. Otherwise, land is not set aside.

Taking the first derivative of equation 5 allows the expected relationship to be determined between each variable and the set aside decision. Discontinuities exist in the relationship because of the presence of the maximum operators. Specifically, three situations exist: (1) target price > loan rate > expected market price; (2) target price > expected market price ≥ loan rate; and (3) expected market price ≥ target price > loan rate. Only the last two situations are explored in this paper. One reason is that since 1988, the loan rate for corn has not significantly effected market price because it has been lower than the market clearing price. A second reason is that the first derivatives for the first and second situations differ only in that the loan rate replaces expected market price in the derivative. Thus, the sign of the derivative does not change; only its magnitude changes.

Assuming set aide is greater than zero (as in 1991), expected maintenance cost per acre set-aside, expected yield, and expected price[3] are negatively related with the decision to set land aside under both situations examined (Table 1). In contrast, variable production cost per acre is positively related with the decision to set land

aside in both situations. The latter derivative is consistent with Vermeer's (p. 17) finding that the average estimated operating cost of participants in the 1961 corn program exceeded the average estimated cost of nonparticipants. Nelson (p. 26) found that participants in the 1982 commodity support program had a higher ratio of fertilizer and energy expenses to total farm sales. Similarly, Goodwin and Featherstone found that, over the 1981 through 1989 period, Kansas farms who received government payments had a higher ratio of variable crop production expenses to gross value of crops.

Payment yield, target price and percent flex acres have conditional relationships with the decision to set land aside. If expected price is less than the target price, payment yield and target price are positively related to the decision to set land aside while percent flex acres is negatively related to the decision. If expected price is greater than or equal to the target price, the first derivative of these three variables does not exist because no deficiency payment is anticipated.

Percent of base acreage to be set aside has an indeterminate relationship with the decision to set land aside. However, because gross market returns including government payments normally exceed variable costs, the decision to participate is probably inversely related to the percent set aside.

Number of base acres also has an indeterminant relationship with the decision to set land aside. Examination of the first derivative reveals that, as the set aside requirement (δ) increases, the first derivative will eventually become negative. All

previous studies have found that larger farms have a higher participation rate (Vermeer; Slaughter; Bonnen; Lin, Johnson, and Calvin; Townsend and Martin; Johnson and Short; Nelson; Reinsel and Banker; Reinsel; Goodwin and Featherstone). This consistent finding suggests that, during the crop years examined by these studies, δ was not large enough to create a negative relationship. Since δ in 1991 is similar or smaller than δ's during previously examined crop years, corn acreage base is expected to be positively related with the decision to set land aside.

A limit on the amount of deficiency payment a farm operator can receive reduces the incentive to set land aside if the limit will be exceeded. Several variables influence the likelihood that the payment limit will be exceeded in any given year, but the most important variable is base acres. As base acres increase, the likelihood of exceeding the payment limit increases. Consequently, the likelihood of setting land aside declines. To capture this potential effect, a squared term on corn base acres is added to the analysis. This term is expected to have a negative relationship with the decision to set land aside.

Farm Business and Operator Characteristics

The same farm business and operator characteristics are likely to be associated with the decision to set land aside as with the decision to establish a base acreage. The reason is that both decisions are interrelated. However, the degree of association may differ since the decisions are also distinct. Because of the interrelationship, this

discussion of farm business and operator characteristics will apply to both decisions. During the remainder of this section, the interrelated decisions to establish an acreage base and set land aside will be termed the decision to participate.

A corn producer who feeds livestock can substitute corn purchased off the farm for corn which could be produced on the set aside acreage. However, inconvenience and cost of transporting corn to the farm suggest that livestock production can act as a deterrent to participating in the corn program. Thus, as the ratio of total gross sales earned from livestock sales increase (i.e., livestock becomes more important), it is hypothesized that the farm operator will be less likely to participate in the corn program. Vermeer; Townsend and Martin; Johnson and Short; Nelson; Reinsel; and Goodwin and Featherstone all found that non-participants raised more livestock than participants.

This study divides livestock production into milk production and the production of other livestock and animal products. Dairy is more labor intensive and time sensitive than other livestock production. In addition, milk production in the context of Ohio implies the inclusion of corn silage in the crop rotation. These considerations suggest that dairy producers may be less likely than other livestock producers to participate on owned acres.

Renting corn land may influence the decision to participate in farm programs on owned corn acres. If economically rational, owners of rented land will try to maximize rental income. Since 1983, returns to variable costs have generally been

larger when a producer participates in the program. Therefore, rental values will tend to reflect the added return to being in the program. Consequently, a farm operator probably will participate in the farm program on rented acres in order to make the rental payment. Participation necessitates transaction costs, such as the time necessary to visit the ASCS office and complete the necessary paper work. Transaction costs on rented land overlap with the transaction costs of being in the program on owned land. Combining these two arguments, the greater the percent of total corn ground that is rented, the more likely the farm operator will participate on owned corn acres.

Previous studies provide mixed evidence regarding rented land. Nelson and Johnson and Short found that participants had a larger amount of rented farmland than did non-participants. Goodwin and Featherstone found the opposite relationship for rented acres as a percent of total acres, while Vermeer found an indeterminant relationship.

The corn program provides farm operators a known income target price and a potential floor on cash market price via the nonrecourse loan. These features are likely to be especially important to farm operators who have more financial risk. Therefore, it is hypothesized that farm financial risk will be positively related to the decision to participate. Townsend and Martin found that financial risk had an insignificant relationship with the set-aside decision of Indiana farm operators, but their analysis included only a limited number of variables.

Vermeer's (p. 32) appraisal of written comments from respondents to a survey concerning the 1961 feed grain program found that opposition to government farm programs was a re-occurring reason for not participating. Lasley, Geller, and Hoiberg; Orazem, Otto and Edelman; Edelman and Lasley; and Barkley and Flinchbaugh are recent examples of studies which found that farm and farm operator characteristics are associated with farm operators' opinions regarding the need for and type of farm programs. Given these findings, it is hypothesized that an operator's support for government farm programs will be related positively with the decision to participate[4].

Estimated Models and Data

The dependent variable in the analysis of the base acreage decision and in the analysis of the set aside decision is binary. It takes a value of one if the operator has a corn base acreage or expects to participate in the 1991 land set aside program.

Since the dependent variables are qualitative, several analytical tools including linear discriminant analysis, probit, and logit can be used. Linear discriminant analysis is strictly applicable only when the underlying variables are jointly normal with equal co-variance matrices. Thus, it is not appropriate in this study because some of the independent variables are qualitative (Anderson). Probit and logit are similar and generate similar results (Capps and Kramer, p. 58). Therefore, the choice between them is arbitrary. For this study, logit is used because the calculation

of probabilities is easier. The specific logit procedure is the one contained in the SHAZAM computer package[5].

The logit equations are estimated using data from a survey of Ohio farm operators conducted in early 1991. One thousand sixteen randomly selected operators were interviewed (Stout et al., p. 1). The operators were asked about their farm enterprises, households, and opinions concerning farm-related issues. They were also asked about their corn program payment yield and base acreage on land they owned, as well as whether they expected to participate in the 1991 corn program on owned acres.

Of the 1,016 farm operators surveyed, 543 had owned corn acres and complete information for all variables incorporated into the base acreage analysis. Because a farm operator can set land aside only if a corn acreage base exists, it is necessary to eliminate from the set-aside analysis the 202 observations which did not have a corn acreage base. Furthermore, only eight farm operators had an expected price at harvest which exceeded the target price of $2.75. Because of the conditional nature of the first derivatives for some independent variables, the small number of these observations makes their analysis infeasible. Consequently, they are eliminated from the set-aside analysis. In total, 341 observations are included in the set-aside analysis. Of these 341 observations, 243 or 71 percent expected to set land aside in 1991.

Owned corn acres is used in the base acre decision because base acres do not exist for farm operators who have not established an ASCS base[6]. Therefore, farm

size is measured as owned corn acres in the base acreage decision. For the same reasons discussed with regard to base acres in the set aside decision, owned corn acres and owned corn acres squared are hypothesized to be positively and negatively related, respectively, with the decision to establish a corn base.

Owned corn acres, owned ASCS corn acreage base, expected corn yield, corn program payment yield, and expected corn price at harvest are taken directly from survey questions. Financial situation of the farm is measured as the farm debt-to-asset ratio. Percent of corn acres rented is calculated as rented corn acres to total corn acres. Importance of livestock production other than milk is measured as the ratio of gross sales earned from livestock and livestock products, excluding milk, to total gross farm sales. Similarly, importance of milk production is measured as a ratio of milk sales to total gross farm sales. Corn expenses per acre is measure as the sum of fertilizer and pesticide expenses per acre because they are the only expenses available[7]. However, these two expenses account for 75 percent of the variable costs of producing corn in the corn belt (USDA, July 1992, p. 12).

Opinion of the farm operator regarding government programs is measured as two binary variables. The first equaled one if the farm operator opposed government programs in agriculture. The second equaled one if the farm operator was neutral to government programs in agriculture. Base value for both dummy variables is that the farm operator supported government programs in agriculture.

To summarize, the following logit regression equations are estimated:

$$(6) \quad Y_i = \alpha + \beta_1 OA_i + \beta_2 AS_i + \beta_3 FPE_i + \beta_4 EY_i + \beta_5 PR_i + \beta_6 LS_i + \beta_7 MS_i + \beta_8 DA_i + \beta_9 OF_i + \beta_{10} OGP_i + \beta_{11} NGP_i + \varepsilon_i$$

$$(7) \quad Z_j = \gamma + \lambda_1 BA_j + \lambda_2 BB_j + \lambda_3 FPE_j + \lambda_4 EY_j + \lambda_5 EP_j + \lambda_6 AY_j + \lambda_7 PR_j + \lambda_8 LS_j + \lambda_9 MS_j + \lambda_{10} DA_j + \lambda_{11} OF_j + \lambda_{12} OGP_j + \lambda_{13} NGP_j + \varepsilon_j$$

where:

Y_i	= Farmer i Did or Did Not Have a Corn Base (1 = yes; 0 = no)
Z_j	= Farmer j Expected to Set Land Aside (1 = yes, 0 = no)
OA	= Owned Corn Acres
AS	= Owned Corn Acres Squared
FPE	= Fertilizer Plus Pesticide Expenses per Acre
EY	= Expected Average Yield
PR	= Percent of Total Corn Acres Rented
LS	= Percent of Total Farm Sales from Livestock and Livestock Products Excluding Milk
MS	= Percent of Total Farm Sales from Milk
DA	= Farm Debt-to-Asset Ratio
OF	= Operator Off-Farm Income
OGP	= Oppose Government Program in Agriculture (Binary Variable)
NGP	= Neutral Toward Government Program in Agriculture (Binary Variable)
BA	= Corn Base Acres
BB	= Corn Base Acres Squared
EP	= Expected Average Price at Harvest
AY	= ASCS Yield
α, β_k	= Regression Parameters
γ, λ_l	= Regression Parameters
ε_i, ε_j	= Random Error Terms

The policy parameters on set aside, flex acres, and target price are established nationally and thus, are the same for all farm operators. Hence, they are not included in this cross sectional analysis. For 1991, the set-aside requirement equalled 7.5 percent (USDA, January 2, 1991, p. 1). Target price was $2.75 per bushel.

RESULTS

All independent variables in the base acreage decision are significant at least at the 10 percent level and have their hypothesized sign (Table 2). With respect to the set aside decision, all independent variables are significant at least at the 10 percent level except for expected price, livestock sales ratio, and chemical expenses per acre (Table 3). The significant variables have their hypothesized signs.

Generally the same variables are significantly associated with the two decisions which jointly compose the farm program participation decision. However, livestock sales ratio is negatively related with the decision to establish a base acreage at the five percent level of significance, but is insignificant with the decision to set land aside. Chemical expenses per acre is positively related with the decision to establish a base acreage at the one percent level of significance, but is insignificant with the decision to set land aside.

Probability of establishing an acreage base on owned land increases at a decreasing rate as owned corn acres increase. Similarly, probability of setting owned land aside increases at a decreasing rate as corn base acres increase. A likely explanation for these comparable findings is the limit on deficiency payments.

If a farm operator supported the need for government programs in agriculture, he/she is significantly more likely to establish a base acreage and set land aside. This finding reflects the role which participant's attitude play in determining the ease with which policy makers can attain policy objectives when participation is voluntary.

To gain further insight into the relative importance of the independent variables, a change in the probability of establishing a corn acreage base and setting land aside for a given change in the independent variable is calculated. The change in probability is determined by first calculating the probability that a corn base is established (land is expected to be set aside) with all independent variables at their mean value[8]. Next, for the non-binary variables the probability is recalculated with the value of one independent variable changed to equal to its mean value plus (0.10 times its standard deviation). The differences between the two probabilities represents the change in the probability for a 0.10 standard deviation change in the independent variable[9]. Because the change in probability is calculated using the standard deviation of the independent variable, it accounts for the relative variability of the independent variable. For the binary variables, change in probability is calculated using the same procedure but with the binary variable set equal to zero and then one.

The farm operator's opinion of farm programs has the highest change in probability and thus can be considered the most important characteristic associated with whether a farm operator establishes a corn acreage base or expects to set land aside (Tables 2 and 3). Number of owned corn acres (corn base acres in the set aside decision) has the next highest probability change. Percent of total corn acres rented, debt-to-asset ratio, and milk sales ratio round out the top five highest probability changes in the base acreage decision. Percent of total corn acres rented, milk sales ratio, and farm debt-to-asset ratio complete the top five in the set aside decision.

Summary, Conclusions, and Implications

This study combines profitability considerations, socioeconomic characteristics, and opinions regarding farm programs into an analysis of the decisions of farm operators to (1) establish a corn acreage base and (2) set land aside. Data from a survey of Ohio farm operators for 1990 is used to conduct the analysis.

Results of this study suggest that larger farms, farms specialized in crop production, and more highly leveraged farms are more likely to participate in the corn program. Assuming that the decision to participate in the corn program is rational, the respective choice of participants and nonparticipants maximize their well being. Therefore, these results in turn suggest that reducing or eliminating the corn program will have a greater impact on farms which are larger, more specialized in crop production, and more leveraged.

Separation of milk production from production of other livestock products reveals that milk production is more likely to be related to non-participation than production of other livestock. Specifically, unlike other livestock production, milk production is significantly and negatively associated with the decision to set land aside.

Neither yield nor chemical expenses per acre are encompassing measures of economic efficiency, but the findings in this study that farm operators who do not have base acres have higher expected yield and lower chemical expenses per acre suggest that corn program participants may be less economically efficient.

The finding that chemical expenses is positively and significantly associated with the decision to establish a corn base is consistent with previous studies which find that participants have higher variable production expenses than nonparticipants. This consistent finding suggests that farm programs act as an umbrella for higher variable cost producers. Umbrella is used because it is not possible to distinguish between producers who participate in farm programs because they are high cost producers in a free market situation and those who increase their use of variable inputs in response to the greater return provided by the farm program relative to the free market. The former use the program to survive, while the latter use the program to expand production. The latter, therefore, allocate farm program benefits between a larger use of variable inputs per participating acre and the well-recognized capitalization of program benefits into land values (Melichar).

Last, results of this study suggest that future analysis of acreage response in the presence of farm programs should include variables other than those needed to calculate economic returns to participation. In particular, inclusion of variables such as farm size, specialization in livestock (especially milk), percent of acres rented, and debt-to-asset ratio, may help explain why participation rates have steadily increased over time.

ENDNOTES

1. Acreage considered planted includes set-aside acreage, acreage prevented from planting due to natural disaster, flex acres, and other acreage as specified in section 503 (c) of the *Food, Agriculture, Conservation, and Trade Act of 1990.*

2. Consistent with the method used to calculate deficiency payments in 1991, expected deficiency payment price would equal the expected U.S. market price during the first five months of the corn marketing year (i.e., September through January).

3. If the loan rate exceeds the expected market price, the first derivative of the loan rate is $\{Y \bullet ASCSB \bullet (1 - \delta) - [(1 - \delta - \Phi) \bullet ASCSB \bullet PY]\}$. Because Y usually exceeds or equals PY, the usual relationship is: the higher the loan rate, the less likely a producer will set land aside.

4. Previous analyses of the participation decision often included age and off-farm income. However, conflicting conceptual arguments as well as conflicting empirical results suggest these variables are unlikely to be significant. Therefore, they were not included in this analysis. As a sensitivity test of this decision, age and off-farm income were added to both regression equations. As expected, they were insignificant.

5. The probit procedure in SHAZAM was employed as a sensitivity test. As expected, its results were similar to those generated by the logit analysis.

6. Because farm operators who do not have a base acreage also do not have a payment yield, payment yield can not be included in the analysis of the base acreage decision.

7. Maintenance cost of setting land aside is not used in this analysis because 24 percent of the farm operators who had a corn acreage base did not report a maintenance cost. Furthermore, farm operators who did not expect to set land aside made up 69 percent of the nonrespondents on maintenance cost but only 31 percent of the operators who had a base acreage. Thus, the nonrespondents were highly skewed toward farm operators who did not expect to set land aside. This finding suggests that many operators who did expect to set land side may have had only limited knowledge to estimate their maintenance cost. Maintenance cost for those who reported it ranged from $0 to $500. Therefore, measurement error may be substantial for maintenance cost among producers who do not expect to set land aside.

8. The formula used to calculate the probability (P) is: $P = 1 / (1 + EXP(-X'B))$. EXP is the exponential function, X is the vector of independent variables and B is the vector of estimated coefficients (Pindyck and Rubinfeld; Fomby, Hill and Johnson).

9. The change in probability also was calculated using the mean value minus 0.10 times the standard deviation. The values were similar to those derived using the mean value plus 0.10 times the standard deviation.

TABLE 1. HYPOTHESIZED RELATIONSHIPS BETWEEN PROFIT ACCOUNTING VARIABLES AND THE DECISION TO SET LAND ASIDE

VARIABLE	FIRST DERIVATIVE	
	TARGET PRICE > EXPECTED PRICE > LOAN RATE	EXPECTED PRICE ≥ TARGET PRICE > LOAN RATE
Production Cost per Acre (VCPA)	$\delta \bullet$ ASCSB	$\delta \bullet$ ASCSB
Maintenance Cost per Acre (MCPA)	$-\delta \bullet$ ASCSB	$-\delta \bullet$ ASCSB
ASCS Base Acreage (ASCSB)	$(-\delta) \bullet (P \bullet Y) + [TP - P] \bullet (1 - \delta - \Phi) \bullet PY + \delta \bullet VCPA - (\delta \bullet MCPA)$	$(-\delta) \bullet (P \bullet Y) + \delta \bullet VCPA - (\delta \bullet MCPA)$
Expected Yield per Acre (Y)	$(-\delta) \bullet (P \bullet ASCSB)$	$(-\delta) \bullet (P \bullet ASCSB)$
Payment Yield per Acre (PY)	$[TP - P] \bullet (1 - \delta - \Phi) \bullet ASCSB$	Does not exist
Expected Price per Bushel (P)	$-\delta \bullet (Y \bullet ASCSB) - [(1 - \delta - \Phi) \bullet ASCSB \bullet PY]$	$-\delta \bullet (Y \bullet ASCSB)$
Target Price (TP)	$(1 - \delta - \Phi) \bullet (ASCSB \bullet PY)$	Does not exist
Percent Land Set-Aside (δ)	$-(P \bullet Y \bullet ASCSB) - [TP - P] \bullet ASCSB \bullet PY + (ASCSB \bullet VCPA) - (ASCSB \bullet MCPA)$	$-(P \bullet Y \bullet ASCSB) + (ASCSB \bullet VCPA) - (ASCSB \bullet MCPA)$
Percent Flex Acres (Φ)	$-[TP - P] \bullet ASCSB \bullet PY$	Does not exist

TABLE 2. FARM PRODUCTION AND OPERATOR CHARACTERISTICS ASSOCIATED WITH THE DECISION TO ESTABLISH A CORN BASE, OHIO, 1991.

INDEPENDENT VARIABLE	ESTIMATED COEFFICIENT	T-RATIO OR F-RATIO[a]	CHANGE IN PROBABILITY AT MEAN[b]
Constant	3.516600	3.98***	NA[c]
Owned Corn Acres	0.007371	2.56**	0.0061
Owned Corn Acres Squared	-0.000005	-1.93**	NA[c]
Corn Expenses per Acre	0.011176	2.28***	0.0022
Expected Yield	-0.012170	-1.77**	-0.0016
% of Total Corn Acres Rented	1.217500	2.58***	0.0026
Livestock Sales Ratio	-1.000600	-2.29***	-0.0022
Milk Sales Ratio	-0.994370	-2.44***	-0.0022
Farm Debt-Asset Ratio	1.736500	1.94**	0.0023
Opinion on Ag Programs[d]			
Oppose	-2.489400	47.91***	-0.2484
Neutral	-1.285400		-0.1239
Summary Statistics			
McFadden R^2	0.26		
Number of Observations	543		
% Correctly Predicted	84.0		

*, **, *** indicates a significant coefficient at 10, 5 and 1% level, respectively.

[a]One-tailed test is used for the single variables. F-ratio is reported for the ag program opinion variables.

[b]For a description of how the probabilities are calculated see the text.

[c]Not applicable. Effect of owned corn acres squared is included with owned corn acres.

[d]Reference value for the dummy variables is: support ag programs.

SOURCE: Ohio Farm Operator Survey, 1990, and Original Calculations

TABLE 3. FARM PRODUCTION AND OPERATOR CHARACTERISTICS ASSOCIATED WITH THE DECISION TO SET ASIDE LAND, OHIO, 1991.

INDEPENDENT VARIABLE	ESTIMATED COEFFICIENT	T-RATIO OR F-RATIO[a]	CHANGE IN PROBABILITY AT MEAN[b]
Constant	-1.849500	-0.97	NA[c]
Corn Base Acres	0.009207	4.17***	0.0288
Corn Base Acres Squared	-0.000006	-3.88***	NA[c]
Corn Expenses per Acre	0.005566	1.22	0.0025
Expected Yield	-0.012381	-1.64*	-0.0037
Payment Yield	0.018318	1.60*	0.0037
Expected Price	0.004397	0.71	0.0014
% of Total Corn Acres Rented	1.275500	2.86***	0.0061
Livestock Sales Ratio	0.433000	0.85	0.0018
Milk Sales Ratio	-1.286600	-2.44***	-0.0052
Farm Debt-Asset Ratio	1.181700	1.74**	0.0038
Opinion on Ag Programs[d]			
Oppose	-1.227400	9.69***	-0.2130
Neutral	-1.163700		-0.2119
Summary Statistics			
McFadden R^2	0.19		
Number of Observations	341		
% Correctly Predicted	76.2		

*, **, *** indicates a significant coefficient at 10, 5, and 1% level, respectively.

[a]One-tailed test is used for the single variables. F-ratio is reported for the ag program opinion variables.

[b]For a description of how the probabilities are calculated see the text.

[c]Not applicable. Effect of corn base acres squared is included with corn base acres.

[d]Reference value for the dummy variables is: support ag programs.

SOURCE: Ohio Farm Operator Survey, 1990, and Original Calculations

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